

LIFE-HISTORY AND BIONOMICS OF TWO PREDACEOUS
AND ONE MYCOPHAGOUS SPECIES OF
COCCINELLIDAE.

BY

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(With a plate)

INTRODUCTORY.

Ladybird beetles may be harmful or beneficial, the former being the reputed pests of certain crops and vegetables, while the latter include predaceous as well as mycophagous species. With the recent development of biological control of insect pests the study of predaceous species has achieved considerable importance. The first successful experiment of this nature, was carried out in California in 1889 to control cottony cushion scale, *Icerya purchasi* through the agency of a ladybird beetle, *Rodolia cardinalis* Muls. from Australia. This enterprise served as a stimulus to applied entomology in the field of biological control. Since the application of predators under field conditions, needs a thorough knowledge of their bionomics and seasonal activities, the present investigations were taken up with a view to studying in detail some of the important species of this province, namely (1) *Chilomenes sexmaculata* Fabr. (2) *Coccinella septempunctata* L. and (3) *Thea cincta* Fabr. Their life-history, morphological characters and habits etc., are described below:—

HISTORICAL.

Mulsant (1866), Crotch (1873), and Gorham (1894), contributed valuable information on the systematics and distribution of various

species of coccinellids. Stebbing (1903) published an account of 16 predaceous species from India and included them in 11 genera. His descriptions include generic characters, life histories of some of the species, feeding habits, distribution as well as description of the adults of *Coccinella septempunctata* and *Chilomenes sexmaculata*. Lefroy (1906) gave the broad characters of the family *Coccinellidae* and briefly described some of the species, with short notes on the colouration of the larvae and adults of *Coccinella septempunctata*, and *Thea cincta* and the life-history of *Chilomenes sexmaculata*. Clausen (1915) added notes on the life-histories, and other biological features of about ten different species except the ones selected for this study. Tullgren (1916) recorded for the first time *Perilitus terminatus*, a parasite of the larva of *Coccinella septempunctata*. Subramanyam (1923) published a list of 38 species and briefly described the adults, feeding habits, distribution and life-histories of a few species, and colour variation in *Chilomenes sexmaculata*. He also described briefly the immature stages of *Thea cincta* and three distinct types of adults in *Chilomenes sexmaculata*. Dobrzhansky (1926) added valuable notes on the systematic position of some genera of *Coccinellidae* on the basis of their genitalia and also studied *Coccinella septempunctata* in this respect, whereas Strouhal (1927) has brought out some structural variations in the mandibles of *Epilachninae*, *Coccinellinae*, and *Psylloborini* as diagnostic characters. Pradhan (1935) contributed on the study of genitalia in *Epilachna indica* and referred to the male genital tube of *Chilomenes sexmaculata* while Volkov (1937) added information on the food of *Coccinella septempunctata* feeding on two species of moths recorded on cotton.

TECHNIQUE.

The material was collected from various crops at the Agricultural College Farm, Poona. For laboratory observations however, rearing was managed in glass jars or tubes of 3" x 1" with muslin tied at the open end. The mycophagous larvae could be reared successfully upto the third instar in similar jars simply by providing small pieces of leaves infested with fungus.

Feeding habits were studied under controlled experiments. The beetles, however, were given more aphids than was actually needed. The first and second stage larvae were fed on young nymphs.

For the study of the mouth parts, specimens were treated in 10 per cent. KOH solution and boiled for about ten minutes. The mouth parts were dissected out, washed in fresh water and preserved in 70% alcohol. The larvae of the first two instars were treated in the same way, but the grown up larvae and the pupae were punctured before treating them with KOH and were kept over night for penetration. The copulating adults were killed instantaneously with chloroform, and treated similarly for further studies. For the study of digestive system, the material was fixed in Carnoy's fluid, white for other systems Allan's modifica-

tion of Bouin's fluid and corrosive sublimate were used. Acid fuschsin proved a useful stain for general purposes, but double staining with Delafield's haematoxylin and eosin was rather more effective. Sketches were made with a Camera Lucida.

DESCRIPTION OF STAGES.

Chilomenes sexmaculata—Egg.—Smooth, cigar-shaped, standing erect deep yellow when fresh, light yellow when about to hatch. Average measurements 1.0 mm. x 0.45 mm. micropyles 26 to 30 arranged in a circle at the free end.

1st Instar Larva.—Yellowish-white when newly hatched, turns to grey subsequently, average measurements 1.65 mm. x 0.46 mm. faint coloured patches on the body; compound spines distinct, bristles variable; head broader posteriorly, bristles 15 pairs, ocelli three, antennae two joined. Prothorax transversely oval, margins rimmed, beset with 8-10 bristles on each side, a compound, well developed spine laterally and a smaller one on each side near the mid-dorsal line and near the posterior edge. The meso- and metathorax have two dorso-lateral compound spines and two smaller ones in the middle of each segment. Each abdominal segment except the last, provided with six compound spines—two median, two dorso-lateral and two lateral, these constitute six longitudinal rows of compound spines; bristles variable in different regions, terminal portion tubular, anal-foot fleshy, broader at the free end and provided with a sucker.

2nd Instar Larva.—Average measurements 2.62 x 0.62 mm.; head 0.34 x 0.48 mm. shining black, compound spines and bristles as in the previous instar, dorsal spines on the fourth and the dorso-lateral spines on the first abdominal segments, white.

3rd Instar Larva.—Average measurements 4.24 x 0.97 mm.; head 0.45 x 0.61 mm. colour deep black, spines as in previous instar.

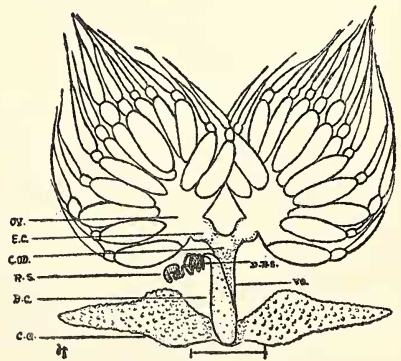
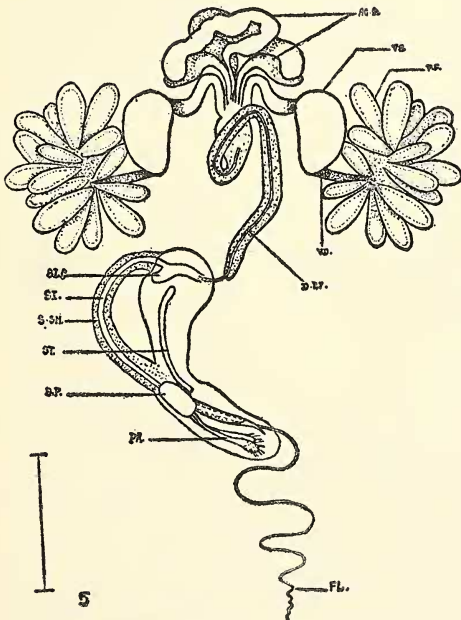
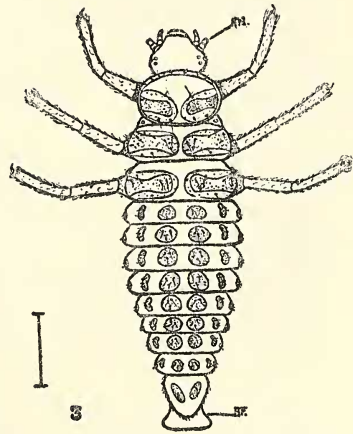
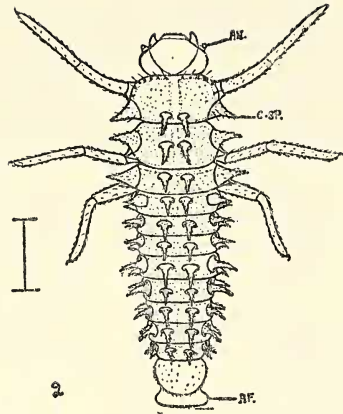
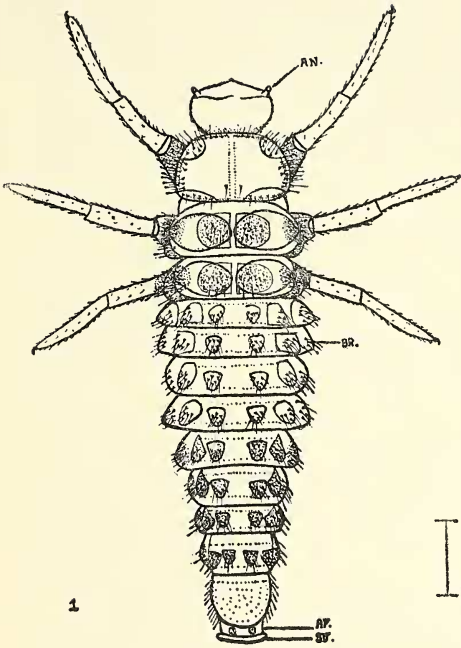
4th Instar Larva.—(Pl. 1. Fig. 2). Average measurements 7.10 x 0.97 mm.; thin white band at the anterior margin of prothorax, white patches between the median pairs of spines and especially between those on the thoracic segments, head brown anteriorly, black posteriorly, legs longish in appearance.

Pupa.—Average measurements 3.65 x 2.65 mm.; oval from above, irregular posteriorly, whitish-yellow with black markings; prothorax deflexed, anterior portion rimmed ventrally, spotted with black posteriorly; elytra visible within sacs; mesothorax with two semicircular black marks, one on each side, posterior edge with a thick oblique black band; metathorax with similar black markings; second to sixth abdominal segments with a pair of pyramidal black marks, one on each side of the mid-dorsal line.

Adult.—Three types—only colour variations, oval, convex above, measurements vary from 3.99 mm. to 5.5 mm.; males smaller than the females, head yellowish-white anteriorly, black posteriorly, 0.88-1.05 mm. in length and 1.00-1.36 mm. in breadth; eyes black, bean-shaped, relatively larger in males; antennae clavate, eleven segmented, 0.44-0.58 mm. long, club three or four jointed; mouth parts modified into chewing and biting type, protheca present, mandibles bifid at the apex, with a basal tooth; prothorax yellow, orange or orange-red with a black spot in the middle, 0.85 to 1.16 mm. long, 2.00-2.55 mm. broad, concave anteriorly, lateral margins deflected. Elytra yellow, orange or orange-red each with two transverse zigzag dark bands, 0.1 mm. broad, and a black oval spot near the apical angle, on an average 3.12 mm. in male, 3.81 mm. in female. Legs retractile, tibia with two spurs at the distal end, the tarsus four jointed, first two segments pubescent, the third minute and the fourth long and thin ending in two claws, the last sternum flat in male with hinder margin notched, triangular in female, a portion of the pygidium visible in male.

Coccinella septempunctata—Egg.—Smooth, cigar-shaped, standing erect, deep yellow, measures on an average, 1.29 mm. x 0.53 mm. micropyles 30, arranged in a circle at the free end.

1st Instar larva.—Black with darker patches—dorsally two on each thoracic segment and laterally two on 2nd and 3rd thoracic segments; six patches on each abdominal segment—two medium, two dorso-lateral and two lateral, ave-



Life-history and Bionomics of predaceous and mycophagous *Coccinellidae*.

For explanation see end of article.

rage measurements 1.88 mm. x 0.50 mm., head with 18 pairs of bristles, antenna two jointed, prothorax 15-18 pairs, distributed around rim, meso- and meta-thorax with nine pairs, 2-5 bristles laterally, three prominent bristles on each abdominal segment at the region of the patches. Ventrally the larva possesses protuberances distributed in the thoracic and abdominal region.

2nd Instar larva.—Black, average measurements 3.43 mm. x 0.81 mm. patches as in the previous instar, dorso-lateral and laterals on the first abdominal segment transformed into orange, and dorso-lateral sides of the prothorax develop warts; number of bristles on each segment increased by 3-5 smaller ones, ventral protuberances developed into bristles and distributed as in previous instar.

3rd Instar larva.—Average measurements 5.02 mm. x 1.28 mm. dorso-lateral and lateral patches on the first abdominal segment deep orange and similar ones on the fourth abdominal segment, bristles on prothorax and warts on all the abdominal segments prominent, ventral groups of bristles as in the previous instars.

4th Instar larva.—(Pl. 1, Fig. 1). Average measurements 11.95 mm. x 2.52 mm. when full grown; head yellow; four orange patches on prothorax, orange coloured dorso-lateral and lateral patches on the first and fourth abdominal segments, warts well developed, ventral bristles conspicuous, rest as in other instars.

Pupa.—Shape similar to the previous example, average measurements 5.67 mm. x 3.83 mm., deep yellow when fresh, subsequently develops black markings, a pair of orange spots on the first abdominal segment and two pairs on the fourth. Eyes prominent; prothorax yellow with two pairs of black dots; mesothorax and metathorax with one pair each; elytra extending to the first two abdominal segments, decorated with three black dots; second to the sixth abdominal segments each with a pair of median and dorso-lateral patches, spiracles distinct.

Adult.—Measurements vary from 5.55-7.27 mm., males relatively smaller in size, oval, convex above; head black, broader posteriorly, mouth parts as in the previous species, white spots near the eyes, each measures 1.27 mm., x 1.62 mm., antennae eleven segmented, 0.88 mm. long, scape the longest, terminal segment the broadest; prothorax deep black with two quadrangular white patches on the anterior angles, more than twice as broad as long, measures 1.34 mm. x 3.14 mm. Proximal tarsal joints pubescent, tibia with two spurs at the distal end; elytra yellow, orange or orange-red, each with three black circular spots longer than broad, average measurements 5.32 mm. x 5.03 mm. The last sternum triangular in female, the anal margin notched in the male.

Thea cincta—*Egg.*—Cigar-shaped, creamy white, chorion sculptured, average measurements 1.04 mm. x 0.4 mm., micropyles 30 in a circle at the free end.

1st Instar larva.—Yellow dorsally, ventral surface white, average measurements 1.61 mm. x 0.38 mm., head with black spots and 18 pairs of bristles, ocelli three, antenna three jointed, prothorax rimmed, bloched, bristles 10-12 pairs, abdominal blotches each beset with three bristles.

2nd Instar larva.—Same as in the previous instar, average measurements 2.85 mm. x 0.59 mm.

3rd Instar larva.—Practically similar to that of the previous instar, average measurements 3.68 mm. x 0.91 mm., prothoracic bloches not complete.

4th Instar larva.—(Pl. 1, Fig. 3). Thorax deep yellow, bloches divided, abdomen banded. Measurements 4.95-6.63 mm. long and 1.44-1.88 mm. broad.

Pupa.—Deep yellow, average measurements 4.08 mm. x 2.75 mm. prothorax rimmed, white, mesothorax slightly depressed in the middle, two black spots; faint black patches on 1-4th abdominal segments, elytra do not meet in the middle.

Adult.—Measurements 4.0 to 4.8 mm. long, males relatively smaller than the females, head yellow, broader than long, measures 0.45 mm. x 1.14 mm.; eyes bean-shaped, relatively bigger in male; mandibles bifid apically,¹ tips dentate antennae eleven segmented, 1.22 mm. long., scape the longest, terminal segment the broadest, last but two segments serrate, prothorax concave anteriorly, curved laterally, broader than twice its length, measurements 0.86 mm. x 2.18 mm., yellowish with two black spots; elytra yellow, rimmed, average measurements 3.52 mm. x 3.42 mm., legs long, yellow, claws each with a basal tooth; last sternum as in the previous example.

FOOD

The predaceous species feed on aphids which have been recorded from the following plants:—

Serial No.	Common English name.	Botanical Name.	Family
1.	Safflower ...	<i>Carthamus tinctorius</i> , L. ...	Compositae.
2.	Cabbage ...	<i>Brassica oleracea</i> ...	Cruciferae.
3.	Knolkhol ...	" sp. ...	"
4.	Turnip ...	" <i>campestris</i> , L. ...	"
5.	Radish ...	<i>Raphanus sativa</i> , L. ...	"
6.	Tondli ...	<i>Coccinia indica</i> , W. & A. ...	Cucurbitaceae
7.*	Jowar ...	<i>Andropogon sorgham</i> , Brot. ...	Gramineae.
8.	Cluster bean ...	<i>Cyamopsis psoralioides</i> , Dc. ...	Leguminosae.
9.	Lentil ...	<i>Lens esculenta</i> , Moench
10.*	Lucerne ...	<i>Medicago sativa</i> , Linn.
11.	Pea ...	<i>Pisum sativum</i> , L.
12.	Linsced ...	<i>Linum usitatissimum</i> , L. ...	Linaceae.
13.*	Cotton ..	<i>Gossypium</i> spp. ...	Mauvaceae.
14.	Lady's finger ...	<i>Hibiscus esculentus</i> , L.
15.*	Mosambi ...	<i>Citrus</i> spp. ...	Rutaceae
16.*	Brinjal ...	<i>Solanum melongena</i> , L. ..	Solanaceae.
17.	Chilly ...	<i>Capsicum annum</i> , L.
18.	Potato ...	<i>Solanum tuberosum</i> , L.
19*	Tobacco ...	<i>Nicotiana tabacum</i> , L.

N.B.—1. * The plants recorded by the previous workers, others are recorded by us which may probably be new ones.

2. The predaceous species have also been recorded on the following plants: (1) Mountain spinach, (2) A spider wort, (3) Bur weed. (4) Chrysanthemum, (5) *Coreopsis aristosa*, (6) a knot grass, (7) *Petunia* and (8) Dill.

LIFE HISTORY.

Oviposition.—Copulation may take place throughout the day. This, however, is not in conformity with Pradhan (1934-35). First copulation after emergence usually takes longer and may last upto two hours. Eggs are generally laid in batches on the under surface of leaves. Copulation as well as oviposition are continued during the life of the adults and sometimes parthenogenetic eggs may also be laid which are usually scattered and do not hatch. In *Chilomenes sexmaculata* Fabr. eggs in each batch are laid in 2-3 rows and their numbers varied from 9 to 22 with a maximum of 2,384 eggs per female in 2 months and 9 days. Pre-oviposition period ranges from 2-4 days. *Coccinella septempunctata* L. lays in irregular batches with a maximum of 82 eggs recorded so far in a batch. Pre-oviposition period varies from 4-5 days during monsoon and 7-10 days during winter. The maximum number of eggs laid by a female was 3,765 in 2 months and 21 days. Eggs of *Thea cincta* Fabr. are also laid in rows and the maximum number recorded in a batch was 28.

Incubation period.—The incubation period is about three days during monsoon when the temperature ranges from 68.0 to 90° F. During winter, however, with the fall in temperature this period extends to four days. Normally hatching is cent per cent but the newly hatched grubs may devour the unhatched eggs. The egg hatches by a vertical slit at its free end. The larva rests over the egg shell and commences free movements after about 3-6 hours.

¹ In *Epilachna 28-punctata*—a purely phytophagous—form the mandibles, are broad at the base, concave laterally, serrate, basal tooth wanting.

Eggs hatch even when immersed in water but not at a low temperature of 10° F.

Larval stage.—There are 4 instars and the total duration varied from 4.6 days to 14.7 days in all the three species. In *Chilomenes sexmaculata* Fabr. it was 4.6 days during July and August and 14.7 days during November and December. In *Coccinella septempunctata* L. the duration was 9.16 days during October and 11.15 days during January and February, and that of *Thea cincta* Fabr. 11.29 days and 12.56 days during July and November-December respectively.

Pupal stage.—Fullgrown larva attaches itself by the hinder end and transforms into a pupa. The pupal stage on an average, extended from 3 to 5.7 days.

Life-cycle—(Table I).—The duration of life-cycle varies from 11-23 days according to the season. The shortest duration was noticed during April and May when the temperature varied from 78° F. to 98° F. During December and January, however, with the fall in the temperature, the duration of life-cycle extended to 23 days. During August 1938 to June 1939 fifteen generations of the predaceous species were reared under laboratory conditions but it has been estimated that about twenty generations may pass during one year.

The average life-cycle of *Chilomenes sexmaculata* Fabr. during monsoon when the maximum and minimum temperatures ranged between 75 to 90° F. and 68-78° F. respectively, was 10.6 days, but it extended to about 22.9 days during winter when the temperatures were comparatively lower. The life-cycle of *Coccinella septempunctata* L. was on an average 16.2 days during the month of October and 18.8 days during January and February while that of *Thea cincta* Fabr. was 17.3 days in July and 20.4 days during November and December. The duration during the month of July however, was very much prolonged as compared with other species.

Longevity of adults.—The beetles are long lived and under laboratory conditions the adults of *Chilomenes sexmaculata*, *Coccinella septempunctata* and *Thea cincta* could survive for about four months, five months and three months respectively. The females when kept alone lived for a relatively longer period.

Habits.—The adults are usually found on the under-surface of leaves. They feign death when disturbed and exude a viscid liquid. This liquid is yellow or amber in colour in the predaceous species and whitish with a tinge of yellow in the mycophagous species.

SEASONAL HISTORY.

In nature *Chilomenes sexmaculata* Fabr. always outnumbered *Coccinella septempunctata* L. in spite of its relatively lower fecundity. From June to February both the species are found on various crops infested by aphids but during summer they are mostly found on lucerne. *Thea cincta* Fabr. on the other hand, found in plentiful on cluster beans and lady's finger during monsoon and on *Coccinia indica* during winter. During hot weather however, adults of *Chilomenes sexmaculata* Fabr., and *Coccinella septempunctata* L. were also found feeding on young nymphs of *Pundaluoya simplicia*, on jowar shoots. It has been observed that *Coccinella septempunctata*, L. and *Chilomenes sexmaculata* Fabr. are found almost in association with each other, and the females generally predominate in numbers (Table II). The two predaceous species are active throughout the year whereas *Thea cincta* Fabr. is not met with during summer. Of all these beetles *Coccinella septempunctata* L. may live upto 41 days without food, but *Thea cincta* Fabr. could not survive for more than four days under such conditions. Under low temperatures however, the adults of *Chilomenes sexmaculata* died after 7 days at 20° F while those at 42° F lost their activity and entered hibernation much earlier. At 50° F the insects showed some activity even after a week.

ECONOMIC IMPORTANCE.

The adults of the predaceous species are more important than their larvae. Lefroy (1906) remarks that a single larva of *Chilomenes sexmaculata* Fabr. consumes about 2,400 aphids during its life-time. This is contrary to our observations because the maximum number of aphids that a single larva could consume during its larval period was 303 in *Chilomenes sexmaculata* and 420 in *Coccinella septempunctata*. The feeding capacity increases with the age.

The adults, however, are great feeders. The maximum number of aphids consumed by a pair of *Chilomenes sexmaculata*, was 16,321 and of *Coccinella septempunctata*, 22,574, during their life, with an average of 60.84 and 106.29 per adult per day respectively.

According to Fernald (1936) about 30,000 adults of *Hippodamia convergens* proved effective over an area of 10 acres, while Dutt (1927) concluded that 3,000 ladybird beetles were enough to control the aphids within fifteen days, in an area of 1,200 sq. feet.

Our observations under controlled conditions yielded that 75 adults of *Chilomenes sexmaculata* could destroy practically all aphids from five cabbage plants which were severely infested with them. With these encouraging results it may be presumed that satisfactory biological control may be achieved through the application of these beetles.

INTERNAL ANATOMY.

Alimentary system.—*Chilomenes sexmaculata* Fabr. Paired pouches anterior to proventriculus and gastric coeca as observed by Landis (1936) in *Ceratomegilla fuscilabris* Muls. are not present, enteric coeca prominent, salivary glands wanting; malpighian tubes six in number.

REPRODUCTIVE SYSTEM¹.

Female.—

Chilomenes sexmaculata Fabr. (Pl. 1, Fig. 4).—Two ovaries, each consisting of 20 ovarian tubules, oviducts, vagina, bursa copulatrix and the receptaculum seminis. Each oviduct measures 0.55 mm., bursa copulatrix stands dorsally on the vagina having its anterior end tapering and somewhat tilted towards the left side on the 4th sternite; receptaculum seminis small, curved, chitinous sac. There is a small accessory gland for the receptaculum seminis. A pair of colleterial glands open laterally in the vagina.

Coccinella septempunctata L.—Each ovary consists of fifty ovarioles. The receptaculum seminis is attached to the bursa copulatrix by a small, slender duct known as the ductus receptaculi that passes through a funnel-shaped dilatation of the infundibulum. The major part of the infundibulum remains within the bursa copulatrix, and its free pointed end is called the cornu. The distal end of the bursa copulatrix does not taper.

Thea cincta Fabr. Each ovary consists of twenty ovarioles; receptaculum seminis relatively small and ringed, attachment to the bursa copulatrix by a small narrow duct.

Male.—

Chilomenes sexmaculata Fabr. (Pl. I, Fig. 5).—A pair of testes, vasa deferentia, vesiculae seminales, ductus ejaculatorius, two pairs of accessory glands and the copulatory organs. Each testis looks like a bunch of grapes of twenty testicular follicles.

The external genitalia consists of a siphon, the penis, basal plates, a trabe and two paramera. The intramittant organ is the siphon and the covering tube is the penis (Siphonal sheath of Pradhan). Siphonal capsule is strongly chitinized, boot-shaped, the distal part of the penis is fused with the basal plates, strongly pointed and slightly curved. Paramera hairy at distal ends, 0.55 mm. long; trabe (strut) rod-like, broader distally.

Coccinella septempunctata L.—Almost similar to that in the previous species but each testis has fifty testicular follicles; accessory glands very long and coiled.

Thea cincta Fabr.—Testicular follicles twenty, ejaculatory duct long; accessory glands very long and coiled. The paramera longer than those in other two species. The distal end of the siphon is spoon-shaped and bears tender hair-like structures.

¹ 1. Nomenclature after T. H. Dobrzhansky.

2. Not described in detail in all the species—only differences are given.

SUMMARY.

The life-history of the two predaceous and one mycophagus species namely *Chilomenes sexmaculata* Fabr., *Coccinella septempunctata* L. and *Thea cincta*, Fabr. respectively is described. Eggs are generally laid in batches on the underside of leaves and hatch within 3-4 days. The maximum number of eggs laid by a female of the first two species, was 2384 and 3765 respectively. The larval stage on an average, varied from 4.6 days to 14.7 days and the pupal stage from 3 to 5.7 days. The duration of life-cycle varied from 11 to 23 days, according to the season. About twenty generations have been estimated during the course of a year. The various stages of the insects, their habits and seasonal activities are described. Of the predaceous species the adults have been found more important from the economic point of view than their larvae. The alimentary system of *Chilomenes sexmaculata* Fabr. and the differences in reproductive systems of all the three species are also discussed.

TABLE I

Life-history of all the three species during 1937-39

Species	Months	Average duration of egg stage	Average duration of larval stage (days)				Total larval stage (days average)	Average pupal stage (Days).	Total duration of life-cycle.
			I	II	III	IV			
<i>1937</i>									
<i>Chilomenes sexmaculata</i> Fabr. ...	July-Aug. ...	3.0	1.1	1.0	1.1	1.4	4.6	3.0	10.6
" "	Nov.-Dec. ...	3.0	3.8	2.0	2.0	4.2	12.0	5.8	20.7
" "	December ...	4.0	4.7	2.6	3.5	3.9	14.7	4.2	22.9
" "	July ...	2.5	1.6	1.0	1.2	2.2	6.0	2.8	10.8
" "	Oct.-Nov. ...	3.0	2.8	2.6	2.0	4.4	11.8	5.0	19.8
<i>1939</i>									
" "	Jan.-Feb. ...	3.0	2.3	2.3	2.5	4.8	12.6	3.0	18.0
<i>1938</i>									
<i>Coccinella septempunctata</i> L. ...	Jan.-Feb. ...	3.0	3.0	1.8	1.9	4.0	10.8	5.0	18.8
" "	October ...	3.0	2.0	1.0	2.7	3.5	9.2	4.0	16.2
<i>1939</i>									
" "	Jan.-Feb. ...	3.0	2.8	1.2	2.7	4.8	11.4	4.0	18.5
<i>1938</i>									
<i>Thea cincta</i> Fabr. ...	Nov.-Dec. ...	3.0	2.6	2.0	2.4	5.6	12.6	4.9	20.4
<i>1939</i>									
" "	July ...	3.0	2.6	2.4	2.5	4.0	11.3	3.5	17.3